

Short reports

Injuries to riders in the cross country phase of eventing: the importance of protective equipment

Michael R Whitlock

Abstract

Objectives—To determine the distribution of injuries in the eventing discipline of equestrian sports and the effectiveness of the protective equipment worn.

Methods—Data on all injuries sustained in the cross country phase over fixed obstacles were collected from 54 days of competition from 1992 to 1997. This involved 16940 rides.

Results—Data on a total of 193 injuries were collected, which included two deaths. This represents an injury rate of 1.1%. Head and facial injuries represented the largest group (31%), with one third of these requiring treatment in hospital. All riders were wearing protective helmets and body protectors.

Conclusions—Eventing is one of the most dangerous equestrian sports. Improved protective equipment, which is mandatory for 1999, should reduce the severity of these injuries.

(Br J Sports Med 1999;33:212-214)

Keywords: horse riding; eventing; protective equipment

Horse riding is known to be a dangerous pursuit, with an average of 16 deaths a year registered between 1982 and 1992.¹ Avery *et al*² noted that there were 98 deaths from horse related injuries between 1982 and 1998 compared with 86 for motor sports. Other studies have found that equestrian injuries amount to 4.3% of all sports related injuries.³ Eventing is becoming increasingly more popular. Over 150 horse trials were run in England in 1997, with more fixtures organised each year.⁴

In professional riding, jockeys have an estimated 2.5% injury rate.⁵ The wearing of a protective helmet has helped to reduce the severity of injuries.^{6,7} Fox hunting in North America has been considered to be no more dangerous than other types of riding, despite no protective helmets being used by most riders.⁸

Head injuries have always been of concern, and several previous studies have highlighted this.⁹⁻¹¹ Barber¹² noted that many of the riders admitted to hospital for a head injury in Oxford were not wearing any form of helmet. When

this survey was repeated by Chitnavis *et al*¹³ 20 years later there was a decrease in the number of admissions following a head injury, and this was thought to be due to more of the riders wearing a helmet. In eventing it has been mandatory to wear a helmet that conforms to Bs4472, similar to that for professional jockeys.¹⁴ The design has been criticised as not offering enough protection,¹⁵ and the standard was amended in 1988.¹⁶ After six deaths in eventing in 1993, four from a head injury, efforts have been made to improve the design of the helmet. For the 1998 season, the *British Horse Trials Rule Book*¹⁷ has made it mandatory to wear a helmet to the specification PAS015¹⁸, the standard CEN 1984,¹⁹ or any other protective headgear as may reasonably be expected to offer a similar, or higher, level of protection.

The wearing of a body protector has been controversial since the introduction of a standard in 1991.²⁰ The Irish Jockey Club have noted fewer rib fractures since its introduction (Hayley M, personal communication), but as the main function is to reduce soft tissue injury, it has been difficult to quantify its effectiveness. The standard has also been amended several times, but a new European standard for body and shoulder protectors was published in 1998.²¹ This will offer several classes of protection, related to the energy absorption of the material used.

There is no published detailed analysis on the number of injuries in eventing, although there is a voluntary reporting system for medical officers.²² This study has investigated the number of injuries to event riders in England, before the introduction of improved safety equipment. A further study will be required to confirm whether the safety equipment reduces the injury severity.

Methods

The author attended as medical officer at 54 days of horse trials from 1992 to 1997. This involves several phases such as dressage, show jumping, and cross country which involves jumping over fixed obstacles. Personal experience has shown that the last of these produces most of the injuries. The standard of competition ranged from pre-novice to advanced Concors Complet International (CCI) events. This standard referred to the ability of the horse, and not necessarily that of the rider. Some of

Wellhouse NHS Trust,
Barnet General
Hospital, Barnet,
Herts EN5 3DJ, United
Kingdom
M R Whitlock

Correspondence to:
M R Whitlock.

Accepted for publication
2 December 1998

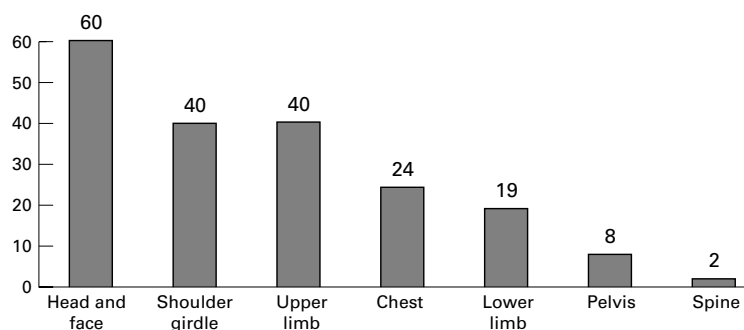


Figure 1 Anatomical distribution of eventing injuries.

the riders would compete with one horse in a novice class, for instance, and a different horse in the advanced section on the same day.

The criterion for an injury was that the rider required medical assistance and was considered unfit to continue riding that day. Hospital records were obtained in relevant cases, but no attempt was made to determine the final outcome. Injuries in the other phases of the competition, such as show jumping, were excluded.

Results

In the 54 days of cross country, 16940 horses competed. There were 193 injuries and two deaths. This represents an injury rate of 1.1% per ride. Both of the deaths occurred in a CCI event, the highest level of the competition. One death was due to a head injury sustained when the horse fell on top of the rider, and the other was due to massive chest injuries incurred also when the horse fell on the rider.

Figure 1 shows the anatomical distribution of the injuries. Most of the injuries were to the head and face (31.1%), with the shoulder girdle being second in frequency (20.7%). Twenty four riders were admitted to hospital, 20 with a head injury. Fifty five of the riders with a head injury were wearing a helmet to Bs4472 standard and five to the PAS015 specification. In two cases the rider was wearing a PAS015 helmet when the horse fell, crushing the head. Both riders were admitted to hospital and discharged within 24 hours.

There were two fractures to the spine, due to direct impact falls on to the ground. One case involved a fracture of T12, as well as several fractures to the transverse processes of the lumbar vertebrae. No riders were partially or permanently paralysed. No soft tissue injuries to the neck were recorded, although it was known that some riders were unable to ride the next day because of neck pain.

All riders were wearing a body protector to a BETA standard, but none of those who sustained a shoulder girdle injury were wearing a shoulder protector to any standard. In comparison there were 20 falls where the rider was wearing a shoulder protector to CEN class 3 standard. These were witnessed falls where the rider might be expected to have sustained a severe injury, but all were able to continue the competition.

Discussion

The results show that there were a large number of head and shoulder injuries, and protection to these areas should be given a high priority. The helmet is designed to withstand direct impacts and not from the rotational element of a head injury. When the Bs4472 standard was amended in 1988 to improve coverage around the sides, the manufacturers produced a more flexible lightweight helmet which was less likely to withstand crush injuries. Although rare, a crush injury, where the horse rolls on the rider, often has a fatal result. Some situations, in which the rider was wearing the more rigid PAS015 helmet, suggest that the severity of injury was reduced, but further studies will be needed to see if the overall severity of head injuries will be reduced by wearing this type of helmet. The PAS015 committee has already noted these findings, and has proposed a modification of the specification to include a simple lateral deformation test.²³ This will ensure that the helmet will be able to withstand some of the crushing effect when a horse rolls on top of the rider's head.

In all cases the rider was wearing some form of body protector, yet 24 chest injuries were recorded, one fatal. The protector is still in the developmental phase and has been improved every year. It is designed to reduce soft tissue injury and possibly provide some protection to the chest and spine from a fall or kick. It may also reduce the severity of injury from a kick to the upper abdomen. No rider who sustained a chest or spinal injury was wearing a protector that conformed to the BETA Class 3 or prEN 13158 standard. It is only when riders wear such garments that an accurate evaluation will be possible. Shoulder protectors have only been recently introduced as part of the standard. There have, however, been 20 witnessed falls where a shoulder injury was expected and the rider was wearing a shoulder protector. In all instances the rider was able to continue the competition. None of the riders who sustained a fracture to the shoulder girdle was wearing any form of protection to that area.

This paper has emphasised the importance of using the highest possible level of safety equipment in the cross country phase of eventing. This is reflected in the requirements for the wearing of helmets in competitions in the United Kingdom, under British Horse Trials Rules. It does not, however, insist on class 3 body protectors, nor shoulder pads. For international competitions, held in the United Kingdom and abroad, the requirements for wearing helmet and body protectors are lower. Perhaps the International Equestrian Federation should consider changing them, in view of the potential risks for riders.

1 Office of Population Censuses and Surveys. Fatal accidents occurring during sporting and leisure activities, 1982–92. Documents DH4 84/3–93/3.

2 Avery JG, Harper P, Ackroyd S. Do we pay too dearly for our sport and leisure? *Public Health* 1990;104:417–23.

3 Lloyd RG. Riding and other equestrian injuries: considerable severity. *Br J Sports Med* 1987;21:22–4.

4 British Horse Trials Association. *Bulletin and Omnibus schedule* 1998. Stoneleigh, Warwickshire.

- 5 Press JM, Davis PD, Weisner SI, *et al.* The National Jockey Injury Study: an analysis of injuries to professional horse racing jockeys. *Clinical Journal of Sports Medicine* 1995;4: 236–40.
- 6 D'Abreu F. Brain damage in jockeys. *Lancet* 1976;1:1241.
- 7 Whitlock M, Whitlock J, Johnson B. Equestrian injuries: a comparison of professional and amateur injuries in Berkshire. *Br J Sports Med* 1987;21:25–6.
- 8 Harrison CS. Fox hunting injuries in North America. *Physician and Sportsmedicine* 1984;12:130–7.
- 9 Brooks WH, Bixby-Hammett DM. Head injuries in equestrian sports. *Physician and Sportsmedicine* 1983;11:82–6.
- 10 Ilgren EB, Teddy PJ, Vafadis J, *et al.* Clinical and pathological studies of brain injuries in horse-riding accidents: a description of cases and review with a warning to the unhelmeted. *Clin Neuropathol* 1984;3:253–9.
- 11 Muwanga LC, Dove AF. Head protection for horse riders: a cause for concern. *Archives of Emergency Medicine* 1985;2: 85–7.
- 12 Barber HM. Horseplay: survey of accidents with horses. *BMJ* 1973;3:532.
- 13 Chitnavis JP, Gibbons CL, Hirigoyen M, *et al.* Accidents with horses: what has changed in 20 years. *Injury* 1996;27: 103–5.
- 14 British Standards Institute 1972. Protective skull caps for jockeys; Bs4472.
- 15 Mills NJ, Whitlock MR. Performance of horse-riding helmets in frontal and side impacts. *Injury* 1989;20:189–92.
- 16 British Standards Institute 1988. Protective skull caps for jockeys; Bs4472.
- 17 British Horse Trials Association Rules Book 1998. Stoneleigh, Warwickshire.
- 18 British Standards Institute 1994. Protective hats for horse riders; Product Approved Specification (PAS)015.
- 19 European Committee for Standardisation (CEN) 1994. Helmets for equestrian activities; prEN 1384.
- 20 British Equestrian Trade Association (BETA) 1991. Protective vests for horse riders.
- 21 European Committee for Standardisation (CEN)1998. Protective jackets, body and shoulder protectors for horse riders; prEN 13158.
- 22 Lloyd Parry J. Risks and injuries in horse-riding sports. In: McLatchie G, Lennox ME, eds. *Soft tissues: trauma and sports injuries*. London: Butterworths, 1993:468–74.
- 23 British Standards Institution 1998. Helmets for equestrian use: Product Assessment Specification PAS 015; 1998.

Take home message

There is a relatively high risk of sustaining an injury during the cross country phase of eventing. This can be reduced by using PAS015 helmets and body/shoulder protectors to the prEN 13158 standard.

The prevalence of chronic knee injury in triathletes

Kirstie Clements, Ben Yates, Michael Curran

Abstract

Objectives—To add to the area of triathlon research by providing much needed prevalence data on knee injury in triathletes.

Method—An incidental “in field” sampling technique was used to interview 58 triathletes aged between 15 and 55 years about knee injury during a triathlon event. The sample comprised 46 men and 12 women.

Results—Most knee injuries occurred during the running event (72%) and affected the lateral side of the knee (38%). In all, 78% of the sample sought treatment from a healthcare professional.

Conclusion—The study has provided much needed prevalence data on chronic knee injury in triathletes. (*Br J Sports Med* 1999;33:214–216)

Keywords: triathlon; knee; Q angle

Triathlon began in Honolulu in 1978 and involves three events, running, cycling, and swimming. According to Williams *et al.*,¹ despite ever increasing interest in the sport, research in this area has lagged far behind that into other sports. The amount of literature available detailing aspects of injury and training regimes is small. Studies have focused on incidence of injury, types of injury suffered, and physiological response to swimming, cycling, and running.^{1–7}

In a study of 72 triathletes by Wilk *et al.*,⁸ three quarters sustained triathlon related musculoskeletal injuries during training as the result of overuse.

Collins *et al.*⁹ surveyed 600 finishers in the Seafair Triathlon in 1986 with a 45% return rate. They reported that 49% of the respondents suffered a training related injury which caused them to stop training for at least one day. Some 70% of the injuries were related to running, and the knee, shoulder, and ankle were the most vulnerable. The investigators noted that higher training mileage for swimming, cycling, and running did not lead to a significantly higher incidence of injury.

A study by Korkia *et al.*¹⁰ also found that the injury incidence was unrelated to the mean amount of weekly training, competition, intensity, or frequency of training in 155 British triathletes over an eight week period. At least one injury was reported by 58 (37%) of the participants. The most affected areas for these triathletes were the ankle/foot, thigh, knee, lower leg, and back. Most (84%) of these injuries were minor, and 83% of the respondents did not have to miss a planned competition.

Ultraendurance triathletes who competed in the 1986 Hawaii Iron Man Triathlon were studied by O'Toole *et al.*¹¹ It was found that 91% of participants had sustained at least one soft tissue injury during the preceding year, and 84% of participants reported knee/thigh injuries.

Cipriani *et al.*¹² surveyed 118 triathletes and found that knee injuries were the most common.

University College
Northampton, Nene
Centre for Healthcare
Education, Park
Campus, Boughton
Green Road,
Northampton, United
Kingdom
K Clements
B Yates
M Curran

Correspondence to:
M Curran, 5 Dover Close,
Manor Farm, Rushden,
Northants NN10 0RQ,
United Kingdom.

Accepted for publication
11 February 1999